

Chapter 7

Hoisting and Rigging



Purpose:

Because of the many types of mechanical lifting machines, the safe lifting of heavy loads is a complicated subject. The use of a wide variety of associated equipment is likewise of concern for safety. This chapter is dedicated to the training and competence of operators.



Scope:

This chapter will describe only the general aspects of hoisting and rigging safety in the following topical areas. The references section shall be used for detail. In particular, the Hanford, "Hoisting and Rigging Manual" is required as a basis for a hoisting and rigging safety program. A DOE hoisting and rigging manual, (DOE-RL-92-36) is issued, and is the Hanford governing document. DOE-STD-1090-96, "DOE Hoisting & Rigging Manual" is the parent document.

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- ❖ Training and Qualification
- ❖ Lifting Equipment
- ❖ Rigging and Tackle
- ❖ Operating Practice
- ❖ Maintenance and Inspection
- ❖ Storage
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- ❖ Fire Safety
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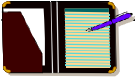
For details see the DOE-RL-92-36, "Hanford Site Hoisting & Rigging Manual" and DOE-STD-1090-96, "DOE Hoisting & Rigging Manual."



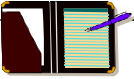
Definitions:

The definitions in this section are those not generally used in industry. Refer to the documents identified in the References Section for common definitions. However, refer to the Hanford Site Hoisting & Rigging Manual, DOE-RL-92-36, for possible differences.

1. *Lift, High-Consequence*: High consequence items and lifts are parts, components, assemblies, or lifting operations designated as such by the responsible management, because the effect of dropping, upset, or collision of items could:
 - a) Cause significant work delay.



- b) Cause undetectable damage resulting in future operational or safety problems.
 - c) Result in significant release of radioactivity or other undesirable conditions.
 - d) Present a potentially unacceptable risk of personnel injury or property damage.
 - e) This category of lift applies when the load imposed upon the equipment to be used will be less than 75% of the rated capacity.
2. *Lift, Special-High-Consequence*: Special-High-Consequence Lifts are High-Consequence Lifts during which the load imposed upon the material-handling equipment to be used will equal or exceed 75% of the rated capacity.
3. *Person-In-Charge (PIC)*: The manager or other responsible person (other than the equipment operator) appointed to be responsible for the safe handling of high-consequence loads and for the safe handling of non-high-consequence items in, around, or above spaces in which high-consequence items are located.
4. *Qualified*: A person, who by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience has successfully demonstrated his ability to solve or resolve problems relating to the subject matter and work.
5. *Qualified Engineer*: Qualified Engineering Organization: An engineer or engineering organization whose competence in evaluation of the type of equipment in question has been demonstrated to the satisfaction of the cognizant manager.
6. *Qualified Inspector*: One whose competence is recognized by DOE, the U.S. Department of Labor, the U.S. Army Corps of Engineers, the State in which inspections are carried out, or the responsible line management. Line management shall have the right and responsibility of review (including right to approve or reject) all qualifications.
7. *Qualified Operator*: One whose competence to operate equipment safely and effectively (including the ability to accurately spot and control loads) has been demonstrated by extensive experience and/or operational tests.
8. *Qualified Rigger*: One whose competence in this skill has been demonstrated by experience satisfactory to the appointed person.

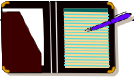


9. *Qualified Rigging Specialist:* One whose competence in this skill has been demonstrated by extensive experience (including rigging and handling of items of a nature akin to the loads to be handled in accordance with this Manual) Satisfactory to the appointed person.
10. *Rated Capacity:* The manufacturer's rated capacity. The maximum hook load which a piece of hoisting equipment is designed to safely carry; also the maximum load which an industrial truck or a sling, hook, shackle, or other rigging tackle is designed to safely carry.
11. *Special-Rated Capacity:* The maximum hook load which a piece of hoisting equipment, or the maximum working load which an industrial truck or piece of rigging tackle is permitted to carry, based on its present condition and the operational conditions as determined by an engineering evaluation, load test, or both. The special-rated capacity may be equal to but not greater than the rated capacity of equipment establish by the manufacturer.



Training and Qualification:

1. All operators of hoisting equipment, and all persons performing rigging to supplement hoisting, shall be trained and qualified in these duties. The level of training shall be appropriate to the complexity of the operation and the potential consequences of accident. It is suggested that operators be segregated into two levels of competence.
 - a) *Incidental Operators:* Persons who may operate small pendant-controlled cranes, manual hoists, and small forklifts as an incidental part of their normal work assignment.
 - b) *Professional Operators:* Persons whose principal assignment is the operation of hoisting and rigging equipment.
2. Riggers, whether working under separate job descriptions or rigging as part of the duties of a qualified operator, shall be trained and qualified in rigging skills.
3. Training, as a minimum, shall include explanations, demonstrations by the trainee, written tests, and continued observation by the supervisor-instructor. Training in operation for ordinary lifts, high-consequence, and special high-consequence lifts shall be required.
4. Qualification shall be based on:
 - a) Trainee demonstrations of his knowledge, skill, and competence.
 - b) Physical condition, and absence of physical disabilities which may contribute to accidents.
 - c) Maturity and conduct.

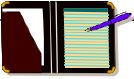


5. Requalification of operators and riggers shall be required at intervals not to exceed three years.
6. The supervisor of each operator or rigger is responsible to determine of that operator or rigger is qualified, though he may use information from other sources, e.g., medical. Complete records of each training activity, demonstration, test, and qualification decision shall be kept (Attachment 1).
7. “Qualified Engineers,” “Qualified Rigging Specialists,” and “Qualified Inspectors” shall be so designed by the responsible supervisor, though he may have assistance in these decisions from other knowledgeable sources. Such designations shall be recorded.
8. The Person in Charge (PIC) of a high-consequence or special high-consequence lift shall be selected and appointed by the line management responsible for the safety of the operation. Such appointments shall be in writing.



Lifting Equipment:

1. *General:* Only equipment which has been built to the appropriate design standards shall be used on ID installations. Existing equipment shall be brought to a level of compliance determined by an appropriate level of management. In some instances the requirements of this manual exceed those of the references. The requirements of this manual shall prevail.
2. *Accessories:* Where load indicating devices are used, they shall meet the requirements of SAE J376 and shall be designed so that failure of the device cannot result in dropping, upset, or loss of control of the load.
3. *Egress:* From cab operated cranes at least two means of egress shall be available. Safe departure shall be possible under emergency conditions.
4. *Control:* Hoists shall have separate brakes for holding and speed control. Limit switches shall prevent hazardous over-travel. With power off, brakes shall set automatically.
5. *Load Limits:* Cranes and hoists shall not be loaded beyond the applicable special rated capacity except for required tests and for properly authorized “special heavy lifts.” Special heavy lifts may be



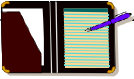
performed only with written procedures and precautions approved by an appropriate level of management.

6. *Markings:* The special rated capacity of each crane or hoist shall be conspicuously displayed on appropriate load blocks. Nameplate data shall be carefully retained on all lift trucks (see ANSI B56.1).
7. *History:* A written history of each piece of hoisting equipment shall be maintained. The history shall record all periodic inspections, all preventive maintenance, all major repairs and alteration, and all lifts in excess of 80% of the special rated capacity. Any other information, which could affect the safe operation of the equipment, should also be recorded.



Rigging and Tackle:

1. *Load Hooks* shall be of forged steel and be designed to good current practice. Hooks for five tons or less shall have safety latches; larger hooks shall have latches if compatible with operating requirements. Hooks shall be regularly inspected and tested with the associated equipment.
2. *Slings*, whether made of wire rope, chain, metal mesh, or synthetic mesh shall be selected for the intended use, shall maintain a safety factor of five or more, and shall be regularly inspected and tested. Their use shall be governed by good practice and accepted load tables. Particular attention shall be given to end attachments and to protection from sharp edges.
3. *Shackles, Links, rings, Turnbuckles, and Related Gear* shall be designed and constructed for the use to which they are put. Improvised devices shall not be used. They shall be regularly tested and inspected.
4. *Wire Rope* shall be selected by type, size and lay for the conditions of its service. It shall be properly cared for and routinely lubricated, inspected and tested with its associated equipment. Re-reeving of wire rope on hoisting equipment shall be done according to the best current practice. It is subject to serious error and shall be done only by qualified persons.
5. *Chain* used in hoisting service shall be selected by type and size for the service. It shall be tested and certified by the manufacturer. It shall be regularly inspected for damage and distortion and shall be measured for wear against accepted wear charts. Roller chain shall not be used in hoisting operations.



6. *Rigging Practice:* Only the best rigging practice shall be used. Gear shall be kept clean and protected from damage. Regular inspection and testing shall be performed.
 - a) Loads shall be stabilized by proper attachment. Sling angle charts shall be used to assure sling loading is within its rated capacity. Accessories shall not be overloaded. Sharp edges shall be avoided.
 - b) All rigging shall be done by qualified riggers.

Operating Practice:

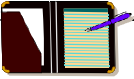


1. Only equipment that has been properly designed, constructed, maintained, inspected and tested shall be operated.
2. Equipment shall be operated only by persons whose qualifications are documented (Attachment 1). Rigging shall be done only by qualified riggers.
3. A qualified person shall classify each lift into the proper category – ordinary, high-consequence, or special-high-consequence. The appropriate rules shall be applied.
4. When riggers or other appointed persons are to assist the operator by means of signals, those signals recommended by the ANSI B30 Series shall be used. Such signalers shall be positively identified by distinctive attire.
5. Equipment shall be operated by written sets of rules. The operating rules in the Hanford, "Hoisting, and Rigging Manual" are an acceptable example.
6. Personnel shall not ride loads, hooks balls, etc. Specific detailed procedures must be established and followed to lift personnel by mechanical means other than a recognized elevator. Though bucket trucks are designed for this purpose, recognized procedures are still required.
7. Equipment in proximity to, or passing under, overhead lines shall be subject to the requirements in 29 CFR 1926.550.



Inspection, Maintenance, and Testing:

1. *Maintenance:*
A formal scheduled maintenance program shall be established for all hoisting and rigging equipment. The program shall, in all respects, meet the manufacturer's recommendations and specifications. Lubrication and lubrication systems shall be included. Complete



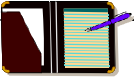
records shall be included. Complete records shall be maintained and made available for examination (Attachment 2).

2. Inspection:

- a) A qualified inspector before use shall inspect all new, reinstalled, altered, modified, or extensively repaired equipment. Full records shall be kept (Attachment 2).
- b) All hoist ropes in regular service shall be visually inspected each working day.
- c) Frequent (monthly or more often depending on the part and the service) the operator or other designated persons shall make inspections of all equipment. The inspector, the frequency, the parts or items, and manner of inspection shall be identified in writing (Attachment 2).
- d) A qualified inspector shall make Periodic (yearly or more often depending on the part and the service) inspections of all equipment. Full records shall be kept (Attachment 2).
- e) High-Consequence and Special High-Consequence Lifts:
Equipment to be used for such service shall have inspections more detailed and more frequent than the periodic inspection. The qualified inspector may require nondestructive testing and other measures to assure the satisfactory condition of the equipment. Full records shall be kept (Attachment 2).

3. Testing:

- a) All new extensively repaired, or altered hoisting and rigging equipment shall, prior to use, be tested by, or under the direction of, a qualified person. Records shall be kept (Attachment 2).
- b) Periodic testing of all hoisting and rigging equipment shall be accomplished at specified intervals not to exceed the following :
 - ❖ Overhead and Gantry Cranes: 3 years
 - ❖ Mobile Cranes: 1 year
 - ❖ Lift Trucks: 1 year
 - ❖ Slings and Accessories: 1 yearTests shall be observed and recorded by a qualified person. Slings shall be tagged with a metal disc which has stamped on it the date of the most recent test.
- c) Equipment overdue for inspection shall be appropriately downgraded to lower rated capacities.
- d) Equipment used to perform high-consequence and special-high-consequence shall be tested before use in such service and at six-month intervals thereafter.
- e) All testing shall be accomplished as directed by a qualified person. The provisions for testing in the Hanford Hoisting and Rigging Manual are strongly recommended as a minimum.
- f) The loads used for testing shall be as specified in the Hanford, Hoisting and Rigging Manual. It is pointed out that RDT F8-6T requires testing of the lifting equipment at 125% of the load to



be lifted in high-consequence and special-high consequence lifts. As the rated capacity of cranes should not be exceeded after the initial test, this effectively reduces the special rated capacity to 80% of the original rated capacity for such lifts.



Storage:

When not in use, all hoisting and rigging equipment shall be stored so as to provide the minimum risk of accident and the maximum protection from damage or excessive wear. Mobile equipment shall be parked on firm footing and shall not be exposed to other traffic. Overhead cranes and hoists shall be left so as to pose the minimum obstruction to other operations. Slings and other tackle shall be stored on racks or as otherwise appropriate. All wire rope, and all slings, shall be kept free of dirt and grit which can cause excessive wear.



Housekeeping:

All hoisting equipment shall be kept reasonably clean, free from trash, and with gear properly stored. Trash and clutter can inhibit proper, careful, operation and can contribute to errors and serious accidents.



Fire Safety:

The principles of fire prevention and protection must be applied for the safety of both equipment and the surrounding facilities. Combustibles shall be kept to a minimum. Fire extinguishers shall be properly inspected, maintained, and positioned. Access to fire protection devices shall not be obstructed.



References:

- ❖ Hoisting and Rigging Manual, Hanford
- ❖ 29 CFR 1910, Subpart N, "Materials Handling and Storage." This reference supplies several additional references which are helpful with respect to detailed specifications.
- ❖ 29 CFR 1926, Applicable Sections On Hoisting & Rigging
- ❖ DOE-RL-92-36, "Hanford Site Hoisting & Rigging Manual"
- ❖ DOE-STD-1090-96, "DOE Hoisting & Rigging Manual."



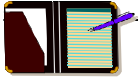
Related Chapters:

- ❖ Chapter 5, "Construction and Demolition."
- ❖ Chapter 6, "Material Handling and Storage."
- ❖ Chapters 13-14, "Industrial Fire Protection."



Attachments:

- ❖ Attachment 1: *Operator and Rigger Training Records*
- ❖ Attachment 2: *Inspection, Maintenance & Testing Records*

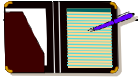


Attachment 1:
Operator and Rigger Training Records



Please insert a copy of applicable training records following this page or indicate the location of these records on the form below.

Facility Name:		
Training Records Location:	Initial:	Date:



Attachment 2:
Inspection, Maintenance & Testing Records



Please insert a copy of applicable records following this page or indicate the location of these records on the form below.

Facility Name:		
Records Location:	Initial:	Date: